

## STEAM TURBINES

exciters and two motor-generator boosters. The total weight of the electrical machinery is about 500 tons.

The generators have a capacity of 12,500 Kw. each, and a voltage range by means of switching of 3000 to 4242 volts. The first voltage is used for operating all four motors from one generator, the second for operating two motors from one generator.

The alternators are, except in the voltage variation respect, similar to land types. The motors are designed to give approximately 29,000 h.p. at 167 revolutions, and are of special design, having rotors of double squirrel cage construction.

The motor stators are provided with a pole changing winding, and are arranged for 24 and 36 poles. A complete set of electric interlocks on the gear is provided.

A number of vessels have been equipped with turbine electric drive, having Ljungstrom turbines as prime movers.

The first vessel of the type was S.S. *Mjdiner*, equipped by the Ljungstrom Company of Stockholm. The principal dimensions of the ship are as follows:

Length, p.p.	..	..
..	225ft.	..
Breadth, extreme	..	..
..	36 ft.	..
Depth, moulded	.....	..
..	15 ft. 6 in.	..
Draught, loaded	..	..
..	14 ft. 9 in.	..
Displacement	..	..
..	2270 tons.	..
Block coefficient at 14 ft. 9 in. draught		
0-665 <sup>m*</sup>		
Gross tonnage	..	..
..	976.	..
Net tonnage	..	..
..	376.	..

The power is given as 900 b.h.p. The generating equipment consists of two 400-Kw. Ljungstrom turbo-

alternators running at 7200 r.p.m., and exhausting into contraflow condensers capable of maintaining a vacuum of 97! per cent. The two 3-phase induction motors running at 900 r.p.m. are geared down to a common propeller shaft running at 88 r.p.m.

On trial the ship maintained a speed of n-8 knots, her coal consumption being 0-89 lb. per i.h.p. hour, and 1-036 lb. per s.h.p. hour, the calorific value of the coal being given as 13,485 B.Th.U. per pound.

Three months\* comparative running trials under similar conditions against a sister ship fitted with reciprocating engines showed a saving in coal consumption of 38-2 per cent in favour of *S.S. Mjolner*.

A somewhat larger vessel, *S.S. Wuhty Castle*, equipped on similar lines with two Ljungstrom turbines each of 625 Kw. capacity at 3600 r.p.m., built by the Brush Company in England, is provided with superheaters capable of raising the steam temperature to 625° F. A full description of this vessel's equipment has appeared in *Engineering*, Vols. CV and CVI, 1918.

A further notable advance in marine turbine equipment is marked by the *S.S. Pacific*, owned by the Overseas Company of Copenhagen, and built by the Copenhagen Dry Dock Company in 1920. In this case the reversibility is attained by means of a clutch, so that the loss in efficiency due to the